I claim:

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1. A differential combined power distribution system for use in rotational driving applications, comprising:

a rotational power source which includes a rotational output shaft coupled to drive a front section load and also coupled with the input shaft of an electromagnetic coupling device to drive a rear section load,

wherein the electromagnetic coupling device includes means for generating a rotating electromagnetic field, and a rotor arranged to electromagnetically couple with said field; and

an operating device which includes means for controlling the electromagnetic coupling device to generate motor driving functions when an input current is applied and to generate variable speed coupling functions through an output current when the electromagnetic coupling device is employed as a generator, the operating device also including means for controlling the electromagnetic coupling device to start the engine and to serve as a power regeneration brake when the engine is the main power source for the front and rear section loads, means for causing the electromagnetic coupling device to charge a battery through a difference between a rotational speed of the rotational field and a rotational speed of the rotor, and means for adjusting the speed difference by controlling a battery charging current.

wherein the operating device thereby allows the rotational power source to be driven at a constant speed and at a partially adjustable speed to improve operating efficiency and decrease pollution, with one part of the differential speed output power generated through the electromagnetic coupling device being used for driving one of the loads independently or together with the rotational power source while the remainder of the output power is converted through the generator function of the electromagnetic coupling device to charge the battery.

2. A differential mixing combined power distribution system, comprising:

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a drive side rotational power source (P**101**) having an output which is first supplied to a front section load and is then transmitted to an input end of a electromagnetic coupling device (M**101**) to drive a rear section load;

the drive side rotational power source (P**101**) including a rotational output shaft (S**102**) coupled to a middle transmission device and a control interface (M**102**) through a clutch (CL**102**), the rotational power source further including a speed sensor (SD**101**) to transmit the engine rotation signal to a central controller (CCU**101**) and a controllable fuel valve (CGIOI) controlled by the central controller (CCU**101**) to carry out the functions of changing the engine speed and keeping the engine maintained at a constant speed;

the middle transmission device and control interface (M**102**) including a speed change control system for driving the front section load only and also for driving both loads;

a middle input shaft (S**101**) coupled at the output end of the clutch (CL**102**);

the electromagnetic coupling device (M**101**) being coupled with the transmission middle shaft (S**101**) to drive the rear side drive unit;

a drive circuit device (D**101**) installed between the electromagnetic coupling device (M**101**) and the battery (BT**101**) and arranged to receive operating commands

from a central controller (CCU**101**) to control the electromagnetic coupling device to function as a generator to charge the battery, supply power to any other loads connected thereto, and to provide a current controllable generator output to change the rotation speed in response to load conditions.

3. A system as claimed in claim **2**, further comprising a brake (**B102**) located between differentially acting output shafts of the electromagnetic coupling device (**M101**) and a coupled rear differential gear box through which the rear section load is driven.

4. A system as claimed in claim **3**, further comprising a clutch (**CL104**) positioned between the brake (**B102**) and the rear section load.

5. A system as claimed in claim **2**, further comprising a clutch (**CL103**) installed between the middle input shaft (**S101**) and the front section load to provide a transmission coupling between the middle transmission device and the front section load.

6. A system as claimed in claim **5**, further comprising a brake (**B102**) located between differentially acting output shafts of the electromagnetic coupling device (**M101**) and a coupled rear differential gear box through which the rear section load is driven.

7. A system as claimed in claim **6**, further comprising a clutch (**CL104**) positioned between the brake (**B102**) and the rear section load.

8. A system as claimed in claim **7**, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

powering the electromagnetic coupling device by the battery to change a speed or direction of the front section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide added power output to drive the front and rear section loads;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

operating the electromagnetic coupling device as a generator to charge the battery using kinetic energy recovered from the front section load;

causing all loads to be braked by engine friction damping;

causing the electromagnetic coupling device to be driven by the engine to function as generator to charge the battery or provide varied or constant frequency alternating current output for different situations; and operation the electromagnetic coupling device as a motor to start the engine.

9. A system as claimed in claim 6, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

causing all loads to be braked by engine friction damping; and

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the battery and to provide an electromagnetic coupling output to any additional loads connected thereto.

10. The system as in claim 5, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

operating the engine at a present speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

causing all loads to be braked by engine friction damping; and

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the battery and to provide an electromagnetic coupling output to any additional loads connected thereto.

11. A system as claimed in claim 4, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the front section load;

causing all loads to be braked by engine friction damping; and

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the battery and to provide an electromagnetic coupling output to any additional loads connected thereto.

12. A system as claimed in claim 4, further including a clutch (CL105) between the rear section output middle shaft and the middle transmission device, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

causing the electromagnetic coupling device to be powered by the battery to change a rotation or speed of the front section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the front section load;

causing all loads to be braked by engine friction damping;

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the battery and to provide an electromagnetic coupling output to any additional loads connected thereto;

operating the engine to drive the front section load and independently operating the electromagnetic coupling device to drive the rear section load; and

operating the engine to drive the front section load and causing the engine to also drive the electromagnetic coupling device to charge the battery.

13. A system as claimed in claim 3, further comprising clutch (CL105) between the rear section output middle shaft

and the middle transmission device, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

causing the electromagnetic coupling device to be powered by the battery to change a rotation or speed of the front section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

causing all loads to be braked by engine friction damping;

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the battery and to provide an electromagnetic coupling output to any additional loads connected thereto;

operating the engine to drive the front section load and independently operating the electromagnetic coupling device to drive the rear section load; and

operating the engine to drive the front section load and causing the engine to also drive the electromagnetic coupling device to charge the battery.

14. A system as claimed in claim **5**, further comprising a clutch (**CL105**) between the rear section output middle shaft and the middle transmission device, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

causing the electromagnetic coupling device to be powered by the battery to change a rotation or speed of the front section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

causing all loads to be braked by engine friction damping;

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the

battery and to provide an electromagnetic coupling output to any additional loads connected thereto;

operating the engine to drive the front section load and independently operating the electromagnetic coupling device to drive the rear section load; and

operating the engine to drive the front section load and causing the engine to also drive the electromagnetic coupling device to charge the battery.

15. A system as claimed in claim **2**, further comprising a clutch (CL**103**) installed between the middle input shaft (S**101**) and the front section load to provide a transmission coupling between the middle transmission device and the front section load, and a clutch (CL**105**) between the rear section output middle shaft and the middle transmission device, wherein the central controller includes means for causing the system to carry out the following functions:

controlling the engine fuel valve to drive the engine from low speed to high speed;

controlling the engine fuel valve and the electromagnetic coupling device simultaneously to drive the engine from low speed to high speed and to charge the battery simultaneously;

changing a speed of the engine by causing the electromagnetic coupling device to generate a current for controlling an output shaft torque;

causing the electromagnetic coupling device to be powered by the battery to change a rotation direction of the rear section load;

causing the electromagnetic coupling device to be powered by the battery to change a rotation or speed of the front section load;

operating the engine at a preset speed while the electromagnetic coupling device is operated as a motor to provide additional power for driving the rear section load;

operating the engine as a generator to charge the battery using kinetic energy recovered from the rear section load;

causing all loads to be braked by engine friction damping;

causing the electromagnetic coupling device to be driven by the engine to function as generator for charging the battery and to provide an electromagnetic coupling output to any additional loads connected thereto;

operating the engine to drive the front section load and independently operating the electromagnetic coupling device to drive the rear section load; and

operating the engine to drive the front section load and causing the engine to also drive the electromagnetic coupling device to charge the battery.

16. A system as claimed in claim **2**, wherein the front and rear section loads are wheels and relationships between the front and rear section loads is set not to operate according to the wheel system ratio relationship, but to operate through a differentially acting adjustment by the electromagnetic coupling device (U**101**).

17. A system as claimed in claim **16**, wherein the differentially acting adjustment of the electromagnetic coupling device (U**101**) includes an active adjustment of the input power when the electromagnetic coupling device functions as a motor and a passive adjustment of the output power when the electromagnetic coupling device functions as a generator.

18. A system as claimed in claim **2**, wherein the front section load is one of front and rear sets of wheels of a vehicle, and the rear section load is the other of the front and rear sets of wheels.

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